

## **Appendix M**

### **Initial CHART Assessment for the Upper Willamette River Steelhead ESU**

#### **CHART Participants**

The CHART for this ESU consisted of the following NOAA Fisheries biologists: Ben Meyer (CHART Leader), Michelle Day, Dan Guy, Lynne Krasnow, Lance Kruzic, Nancy Munn, Mindy Simmons, Cathy Tortorici, and Rich Turner. This CHART assessment also benefitted from review and comments from the Oregon Department of Fish and Wildlife.

#### **ESU Description**

The Upper Willamette River O. mykiss ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive) (64 FR 14517; March 25, 1999). The following description is based largely on excerpts from the Willamette/Lower Columbia River Technical Recovery Team's (TRT) recent review of historical population structure for this ESU (Myers et al. 2003).

Of the three temporal runs of steelhead currently found in the Upper Willamette River ESU only the late-run winter steelhead is considered to be native. The same flow conditions at Willamette Falls that only provided access for spring-run chinook salmon also provided an isolating mechanism for this unique run time of steelhead. The predominant tributaries to the Willamette River that historically supported winter steelhead all drain the Cascade Range. The TRT has identified most of these drainages as a historically demographically independent population (DIP): Molalla, North Santiam, South Santiam, and Calapooia rivers. Steelhead populations in the upper Willamette River basin have been strongly influenced by extensive hatchery transfers of fish throughout the ESU and the introduction of summer-run steelhead (facilitated by the laddering of Willamette Falls). Summer-run steelhead are still stocked in the upper Willamette River, but the stocking of winter-run steelhead in the Willamette River has been discontinued (although non-native winter-run fish still return).

It is generally agreed that steelhead did not historically emigrate farther upstream than the Calapooia River. Also, the TRT reviewed evidence of steelhead using westside tributaries to the Willamette River and concluded that "with the exception of the Tualatin River, there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP.

Late-run upper Willamette River winter steelhead are considered an ocean-maturing type of steelhead in that they enter fresh water with well-developed gonads and typically spawn shortly thereafter. Maturing fish enter the Willamette River beginning in January and February, but do not ascend to their spawning areas until late March or April. Spawning takes place from April to June, typically peaking in May and occurs in both mainstem and tributary habitats in the major Cascade drainages identified above. Presently, native steelhead are distributed in a few, relatively small, naturally spawning aggregations.

The juvenile life-history characteristics of Upper Willamette River steelhead are summarized (where known) in ODFW (1990) and Olsen et al. (1992). In the subbasins reviewed, egg/alevin incubation and fry emergence occurred from April to August. Juveniles spend two winters rearing in freshwater before emigrating to the ocean from March to July. Upper Willamette River winter steelhead typically spawn as 4 year olds after two years in the ocean.

#### **CHART Area Assessments and Initial Conservation Value Ratings**

The Willamette/Lower Columbia Technical Recovery Team (TRT) has identified groups of populations in this recovery planning domain into “strata” intended to assist in evaluating ESU-wide recovery scenarios (McElhany et al. 2002). The strata are based on major life history characteristics (e.g., species run types) and ecological zones. The Upper Willamette River steelhead ESU consists of a single stratum due to it being a single run type (winter-run fish) that spawns within a single ecological zone (Willamette River). Recovery planning will likely emphasize the need for a geographical distribution of viable populations across the range of such strata/regions in an ESU (Ruckelshaus et al. 2002, McElhany et al. 2003). Therefore, as part of its assessment the CHART considered the conservation value of each HUC5 in the context of the populations within this stratum.

The CHART assessment for this ESU addressed 7 subbasins containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Subbasins were chosen as freshwater critical habitat units because they present a convenient and systematic way to organize the CHART’s watershed assessments for this ESU.

#### **Unit 1. Upper Willamette Subbasin (HUC4# 17090003)**

The Upper Willamette subbasin contains both eastside and westside drainages as well as the mainstem Willamette River upstream of its confluence with the Santiam River. The subbasin is contained

in the following Oregon counties: Benton, Linn, and Polk. Some areas of the subbasin also occur in Lane and Lincoln counties but these are outside the range of the ESU. The subbasin contains six watersheds, three of which are occupied by this ESU and encompass approximately 765 mi<sup>2</sup> and 953 miles of streams. Fish distribution and habitat use data from the Oregon Department of Fish and Wildlife (ODFW) identify approximately 241 miles of occupied riverine habitat in the watersheds (ODFW 2003A,B). Myers et al. (2003) identified possibly two demographically independent populations in this subbasin (the CHART questioned the South Santiam population's presence here), but only one with spawning habitat (Calapooia River). Myers et al. (2003) also noted that there is considerable debate about the origin of naturally spawning winter-run steelhead currently found in several westside tributaries. These authors went on to state that (with the exception of the Tualatin River) "there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population]."

The CHART concluded that, despite uncertainties regarding the population status of *O. mykiss* in the watersheds in this subbasin, both likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map M1 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that one of the occupied HUC5 watersheds (Calapooia River) in this subbasin was of high and two were of medium conservation value to the ESU. The CHART also concluded that all reaches of the Willamette River within this subbasin constitute a high value rearing and migration corridor for the Calapooia River population with downstream reaches and the ocean. The CHART noted that, given the limited number of populations in this ESU, westside habitats in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded that the Luckiamute River HUC5 may have the highest potential conservation benefit in this subbasin and therefore assigned it a provisional medium conservation value. Table M2 summarizes the CHART's PCE/watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings

by HUC5 watershed. Among the key considerations identified in Table M2, the CHART noted that the Calapooia River HUC5 was the only one identified as having spawning habitat supporting a demographically independent population in this subbasin.

## **Unit 2. North Santiam River Subbasin (HUC4# 17090005)**

The North Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Clackamas, Linn, and Marion counties, Oregon. The subbasin contains six watersheds, three of which are occupied by this ESU and encompass approximately 315 mi<sup>2</sup> and 340 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 137 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (North Santiam River) in this subbasin. Historically accessible areas in the three uppermost watersheds of this subbasin are now blocked by Big Cliff and Detroit dams but may have been productive steelhead habitat (Parkhurst 1950). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map M2 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of high conservation value to the ESU. Table M2 summarizes the CHART's PCE/watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table M2, the CHART noted that there are very few populations in this ESU and that the TRT has classified the North Santiam River steelhead as both a core population (historically abundant and "may offer the most likely path to recovery") as well as a genetic legacy population (one of the "the most intact representatives of the genetic character of the ESU") (McElhany et al. 2003). Similarly, ODFW considered the upper North Santiam River and Little North Santiam River as priority areas for steelhead, noting that these areas had high production potential and monitoring potential, but low habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001). Also, occupied reaches in Little North Santiam HUC5 overlap with a FEMAT key watershed for at-risk anadromous salmonids (FEMAT 1994).

The CHART also considered whether the three inaccessible HUC5s (Upper North Santiam, North Fork Breitenbush River, and Detroit Reservoir/Blowout Divide Creek)

may be essential to the conservation of this ESU but concluded that, in contrast to Willamette River spring chinook, it is less certain whether these inaccessible HUC5s may be essential for the conservation of the Upper Willamette River steelhead ESU.

### **Unit 3. South Santiam River Subbasin (HUC4# 17090006)**

The South Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Linn County, Oregon. The subbasin contains eight watersheds, six of which are occupied by this ESU and encompass approximately 766 mi<sup>2</sup> and 860 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 230 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Two watersheds in the upper Middle Santiam River (Quartzville Creek and Middle Santiam River) are blocked by Green Peter Dam. Myers et al. (2003) identified one demographically independent population (South Santiam River) in this subbasin. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map M3 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of high conservation value to the ESU. Table M2 summarizes the CHART's PCE/watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table M2, the CHART noted that there are very few populations in this ESU and that the TRT has classified the South Santiam River steelhead as both a core population (historically abundant and "may offer the most likely path to recovery") as well as a genetic legacy population (one of the "the most intact representatives of the genetic character of the ESU") (McElhany et al. 2003). Similarly, ODFW considered the upper South Santiam River as a priority area for steelhead, noting that this area had high production potential and monitoring potential, and moderate habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001). This assessment also noted that the Upper South Santiam "is at such low abundance that an extirpation warning is warranted" (Oregon Plan for Salmon and Watersheds 2001).

### **Unit 4. Middle Willamette River Subbasin (HUC4# 17090007)**

The Middle Willamette River subbasin encompasses most of the valley floor reaches of the Willamette River upstream of Willamette Falls and is contained in the following Oregon counties: Clackamas, Marion, Polk, Yamhill, and Washington. The subbasin consists of four watersheds, all of which are occupied by this ESU and encompass approximately 712 mi<sup>2</sup> and 922 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 175 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (North Santiam River) that spawns in this subbasin, although three populations use this subbasin for rearing/migration. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map M4 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of low conservation value to the ESU. However, that assessment pertained solely to the tributary streams in these watersheds (e.g., Ash, Rickreall, and Harvey creeks), not the mainstem Willamette River nor the Mill Creek reaches connecting to the North Santiam River. The CHART concluded that all reaches of the Willamette River within this subbasin constitute a high value rearing and migration corridor. These high value reaches connect all populations and HUC5s in this ESU with downstream reaches and the ocean. Table M2 summarizes the CHART's PCE/watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed.

#### **Unit 5. Yamhill River Subbasin (HUC4# 17090008)**

The Yamhill River subbasin is a Coast Range drainage of the middle Willamette River and is contained primarily in Polk, Tillamook, and Yamhill counties, Oregon (with very small and unoccupied portions in Lincoln and Washington counties as well). The subbasin contains seven watersheds, all of which are occupied by this ESU and encompass approximately 772 mi<sup>2</sup> and 966 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 319 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003A,B). Myers et al. (2003) did not identify a demographically independent population in this subbasin. These authors noted that there is considerable debate about the origin of naturally spawning winter-run

steelhead currently found in several westside tributaries and went on to state that (with the exception of the Tualatin River) “there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population].”

The CHART concluded that, despite uncertainties regarding the population status of O. mykiss in the watersheds in this subbasin, they likely contain one or more PCEs for this ESU. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as management activities that may affect these reaches in the watersheds. Map M5 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether these areas qualify for consideration as critical habitat for this ESU. However, the CHART noted that, given the limited number of populations in this ESU, habitat in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded that the Upper South Yamhill River HUC5 may have the highest potential conservation value in this subbasin and therefore assigned it a medium conservation value while habitat areas in the remaining six watersheds warrant a low conservation value to the ESU. Table M2 summarizes the CHART’s watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed.

#### **Unit 6. Molalla/Pudding River Subbasin (HUC4# 17090009)**

The Molalla/Pudding River subbasin is an eastside drainage of the middle Willamette River and contained in Clackamas and Marion counties, Oregon. The subbasin contains six watersheds occupied by this ESU and encompasses approximately 875 mi<sup>2</sup> and 1,057 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 284 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map M6 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin ranged from high to low conservation value to the ESU. Of the six HUC5s reviewed, one was rated as having high (Upper Molalla River HUC5), three were rated as having medium and two were rated as having low conservation value. Table M2 summarizes the CHART's PCE/watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table M2, the CHART noted that ODFW considered the Molalla River as a priority area for steelhead, noting that this area had high production potential and monitoring potential, and moderate habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001).

#### **Unit 7. Tualatin River Subbasin (HUC4# 17090010)**

The Tualatin River subbasin is a Coast Range drainage of the middle Willamette River and contained in Clackamas, Columbia, Multnomah, Tillamook, Washington, and Yamhill counties. The subbasin contains five watersheds, all of which are occupied by this ESU and encompass approximately 709 mi<sup>2</sup> and 889 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 298 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Myers et al. (2003) did not identify a demographically independent population in this subbasin. These authors noted that there is considerable debate about the origin of naturally spawning winter-run steelhead currently found in several westside tributaries and went on to state that (with the exception of the Tualatin River) "there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population]."

The CHART concluded that, despite uncertainties regarding the population status of *O. mykiss* in the watersheds in this subbasin, they likely contain one or more PCEs for this ESU. Table M1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as management activities that may affect these reaches in the watersheds. Map M7 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether these areas qualify for consideration as critical habitat for this ESU. However, the CHART noted that, given the limited number of populations in this ESU, habitat in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded



that the Gales Creek HUC5 may have the highest potential conservation benefit in this subbasin and therefore assigned it a medium conservation value, while habitat areas in the remaining four watersheds warrant a low conservation value to the ESU. The CHART noted that Gales Creek was the one westside watershed with some evidence of possible historic use by steelhead (Parkhurst et al. 1950 as described in Myers et al. 2003). Table M2 summarizes the CHART's watershed scores and initial conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed.

## **Unit 8. Lower Willamette/Columbia River Corridor**

For the purposes of describing units of critical habitat designation for this ESU, NOAA Fisheries defines the lower Willamette/Columbia River corridor as that segment from the confluence of the Willamette and Clackamas rivers to the Pacific Ocean. This corridor also includes the Multnomah Channel portion of the Lower Willamette River.

Watersheds downstream of the Clackamas River subbasin (Johnson Creek and Columbia Slough/Willamette River HUC5s) are outside the spawning range of this ESU and likely used in a limited way as juvenile rearing habitat for this ESU. Fish distribution and habitat use data from ODFW identify approximately 138 miles of occupied riverine and estuarine habitat in this corridor (ODFW 2003A,B).

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the lower Willamette/Columbia River corridor was of high conservation value to the ESU. The CHART noted that this corridor connects every watershed and population in this ESU with the ocean and is used by rearing/migrating juveniles and migrating adults. The Columbia River estuary is a particularly important area for this ESU as both juveniles and adults make the critical physiological transition between life in freshwater and marine habitats (Marriott et al. 2002).

### *Marine Areas*

NOAA Fisheries' analysis focused on freshwater and estuarine habitats upstream of the mouth of the Columbia River. While marine areas are occupied by this ESU, within this vast area the agency has not identified "specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features . . . essential to the conservation of the species."

## **References and Sources of Information**

References cited above as well as key reports and data sets reviewed by the CHART include the following:

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**Table M1.** Summary of Occupied Areas, PCEs, and Management Activities Affecting PCEs for the Upper Willamette River Steelhead ESU

Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Spawning / Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Presence/ Migration Only PCEs (mi)*	Management Activities**
M1	Upper Willamette	Calapooia River	1709000303	56.3	16.4	0.0	A, F, R, U
M1	Upper Willamette	Oak Creek	1709000304	0.0	34.4	0.0	A, R, U
M1	Upper Willamette	Luckiamute River	1709000306	31.5	102.1	0.0	A
M2	North Santiam	Middle North Santiam River	1709000504	27.9	0.0	0.0	A, D, F, R
M2	North Santiam	Little North Santiam River	1709000505	27.9	0.0	0.0	A, F, M
M2	North Santiam	Lower North Santiam River	1709000506	43.6	37.3	0.0	A, D, F, I, S, U
M3	South Santiam	Hamilton Creek/South Santiam River	1709000601	27.5	30.5	5.4	A, C, D, F, I, R, U
M3	South Santiam	Crabtree Creek	1709000602	37.7	8.8	0.0	A, C, F, R
M3	South Santiam	Thomas Creek	1709000603	19.4	22.7	0.0	A, D, F, R
M3	South Santiam	South Santiam River	1709000606	32.9	0.4	0.0	D, F
M3	South Santiam	South Santiam River / Foster Reservoir	1709000607	11.7	8.0	0.0	D, F
M3	South Santiam	Wiley Creek	1709000608	22.9	1.9	0.0	F
M4	Middle Willamette	Mill Creek/Willamette River	1709000701	21.2	10.5	0.0	A, C, I, R, U
M4	Middle Willamette	Rickreall Creek	1709000702	11.6	49.2	0.0	A, R, U
M4	Middle Willamette	Willamette River/Chehalem Creek	1709000703	3.0	60.7	0.0	A, C, R, U, W
M4	Middle Willamette	Abernethy Creek	1709000704	0.0	20.4	0.0	A, C, R, U, W
M5	Yamhill	Upper South Yamhill River	1709000801	40.2	36.8	0.0	A, F
M5	Yamhill	Willamina Creek	1709000802	22.5	11.0	0.0	A, F
M5	Yamhill	Mill Creek/South Yamhill River	1709000803	5.3	13.2	0.0	A

M5	Yamhill	Lower South Yamhill River	1709000804	3.1	46.1	0.0	A, C, R, U
M5	Yamhill	Salt Creek/South Yamhill River	1709000805	0.0	9.3	0.0	A
M5	Yamhill	North Yamhill River	1709000806	34.7	54.1	0.0	A, U
M5	Yamhill	Yamhill River	1709000807	0.0	43.0	0.0	A, R, U
M6	Molalla/Pudding	Abiqua Creek/Pudding River	1709000901	35.2	22.5	0.0	A, F, R
M6	Molalla/Pudding	Butte Creek/Pudding River	1709000902	17.3	34.5	0.0	A, F, R
M6	Molalla/Pudding	Rock Creek/Pudding River	1709000903	6.4	0.0	0.0	A, I, R
M6	Molalla/Pudding	Senecal Creek/Mill Creek	1709000904	0.0	29.5	0.0	A, U
M6	Molalla/Pudding	Upper Molalla River	1709000905	72.8	0.0	0.0	A, F, R
M6	Molalla/Pudding	Lower Molalla River	1709000906	17.2	48.5	0.0	A, C, F, R, U
M7	Tualatin	Dairy Creek	1709001001	50.6	57.7	0.0	A, C, F, R, U
M7	Tualatin	Gales Creek	1709001002	39.3	15.2	0.0	A, C, F, R, U
M7	Tualatin	Scoggins Creek	1709001003	20.3	5.4	0.7	A, C, D, F, R, U
M7	Tualatin	Rock Creek/Tualatin River	1709001004	23.1	13.7	21.0	A, C, R, U
M7	Tualatin	Lower Tualatin River	1709001005	13.1	8.9	28.8	A, C, R, U
	Multiple	Lower Willamette/Columbia Rivers	NA	0.0	125	0.0	C, D, I, R, T, U, W

\* Some streams classified as “Presence/Migration Only PCEs” may also include rearing or spawning PCEs, but the GIS data are still undergoing review to confirm species use type.

\*\* This list is not exhaustive. It is intended to highlight key management activities affecting PCEs in each watershed. Activities identified are based on the general categories described by Spence et al. (1996) and summarized previously in the “Special Management Considerations or Protection” section of this report. Coding is as follows: F= forestry, G = grazing, A = agriculture, C = channel modifications/diking, R = road building/maintenance, U = urbanization, S = sand and gravel mining, M = mineral mining, D = dams, I = irrigation impoundments and withdrawals, T = river, estuary, and ocean traffic, W = wetland loss/removal, B = beaver removal, X = exotic/invasive species introductions, H = forage fish/species harvest. Primary sources for this information were the CHART and reports by Bastasch et al. (2003), Hulse et al. (2002), Pearson (2003), ODFW (1990a-f, 1992), and land use/land cover GIS layers from the U.S. Geological Survey.

**Table M2.** Summary of Initial CHART Scores and Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Steelhead ESU

Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
M1	Upper Willamette	Calapooia River	1709000303	9	Moderate HUC5 score; HUC5 contains all spawning PCEs for one of only four demographically independent populations in this ESU	High
M1	Upper Willamette	Oak Creek	1709000304	8	Moderate HUC5 score; CHART concluded that tributaries are low value relative to other HUC5s, but rearing/migration PCEs in Willamette corridor are highly essential for upstream HUC5s (Calapooia River population)	Medium
M1	Upper Willamette	Luckiamute River	1709000306	8	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
M2	North Santiam	Middle North Santiam River	1709000504	9	Moderate HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead	High
M2	North Santiam	Little North Santiam River	1709000505	12	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead; PCEs are in a FEMAT key watershed	High

<sup>14</sup> PCE/watershed scores were derived using the CHART scoring process described in the introduction to this report. The CHART employed an earlier 5-factor version of the scoring matrix for three ESUs (Columbia River chum salmon and Upper Willamette River chinook salmon and steelhead) therefore the maximum points possible for these ESUs was 15.

Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
M2	North Santiam	Lower North Santiam River	1709000506	9	Moderate HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead; high value connectivity reaches for upstream HUC5s	High
M3	South Santiam	Hamilton Creek/South Santiam River	1709000601	9	Moderate HUC5 score; PCEs support a TRT core and legacy population; high value connectivity reaches for all HUC5s in this subbasin	High
M3	South Santiam	Crabtree Creek	1709000602	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High
M3	South Santiam	Thomas Creek	1709000603	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High
M3	South Santiam	South Santiam River	1709000606	12	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers upper South Santiam as priority area for steelhead	High
M3	South Santiam	South Santiam River / Foster Reservoir	1709000607	11	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers upper South Santiam as priority area for steelhead	High
M3	South Santiam	Wiley Creek	1709000608	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High
M4	Middle Willamette	Mill Creek/ Willamette River	1709000701	5	Low HUC5 score; spawning PCEs may support one TRT population (North Santiam River); primary importance of this HUC5 is as connectivity corridor for upstream HUC5s in North Santiam subbasin	Low



Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
M4	Middle Willamette	Rickreall Creek	1709000702	7	Low-moderate HUC5 score; PCEs in Willamette corridor are highly essential and support three TRT populations	Low
M4	Middle Willamette	Willamette River/ Chehalem Creek	1709000703	8	Moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
M4	Middle Willamette	Abernethy Creek	1709000704	7	Low-moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
M5	Yamhill	Upper South Yamhill River	1709000801	9	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
M5	Yamhill	Willamina Creek	1709000802	8	Not identified as supporting a demographically independent population	Low
M5	Yamhill	Mill Creek/South Yamhill River	1709000803	7	Not identified as supporting a demographically independent population	Low
M5	Yamhill	Lower South Yamhill River	1709000804	7	Not identified as supporting a demographically independent population	Low
M5	Yamhill	Salt Creek/South Yamhill River	1709000805	4	Not identified as supporting a demographically independent population	Low
M5	Yamhill	North Yamhill River	1709000806	8	Not identified as supporting a demographically independent population	Low

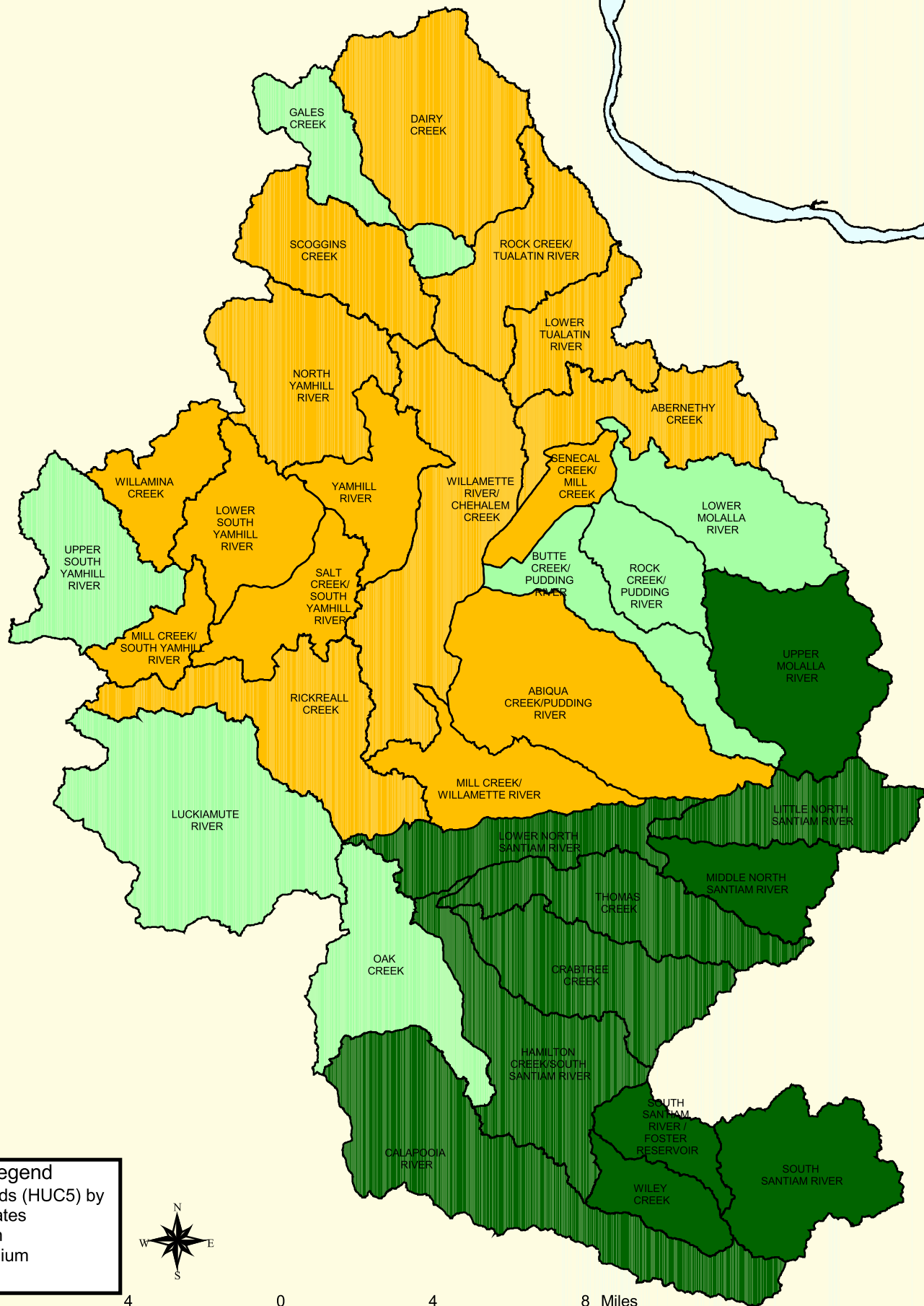
Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
M5	Yamhill	Yamhill River	1709000807	8	Not identified as supporting a demographically independent population	Low
M6	Molalla/Pudding	Abiqua Creek/ Pudding River	1709000901	7	Low-moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; CHART considered that this HUC5 had relatively lower PCE quality than others supporting this population	Low
M6	Molalla/Pudding	Butte Creek/ Pudding River	1709000902	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead	Medium
M6	Molalla/Pudding	Rock Creek/ Pudding River	1709000903	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead	Medium
M6	Molalla/Pudding	Senecal Creek/ Mill Creek	1709000904	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; no spawning PCEs and limited tributary habitat; CHART determined that this HUC5 had relatively lower PCE quality and quantity than others supporting this population; connectivity reaches are of medium value to Rock Creek/Pudding River and Butte Creek/Pudding River HUC5s upstream	Low

Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
M6	Molalla/Pudding	Upper Molalla River	1709000905	9	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; CHART considered that this HUC5 likely has best PCE quality of all supporting this population	High
M6	Molalla/Pudding	Lower Molalla River	1709000906	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead	Medium
M7	Tualatin	Dairy Creek	1709001001	8	Not identified as supporting a demographically independent population	Low
M7	Tualatin	Gales Creek	1709001002	9	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
M7	Tualatin	Scoggins Creek	1709001003	7	Not identified as supporting a demographically independent population	Low
M7	Tualatin	Rock Creek/ Tualatin River	1709001004	7	Not identified as supporting a demographically independent population	Low
M7	Tualatin	Lower Tualatin River	1709001005	7	Not identified as supporting a demographically independent population	Low

Map Code	Subbasin	Watershed/ Corridor	HUC5 Code	Total HUC5 Score (0-18) <sup>14</sup>	Comments/Other Considerations	Initial CHART Rating of Conservation Value
	Multiple	Lower Willamette/Columbia River Corridor	NA	NA	Area not scored since many reaches are outside HUC5 boundaries. However, The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation	High

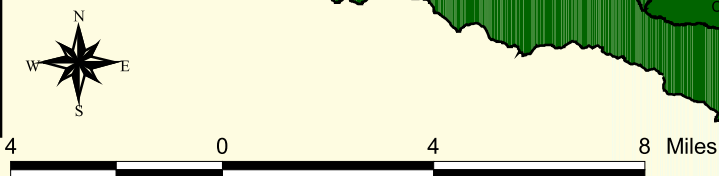
**Figure M1.** Initial CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Steelhead ESU

DRAFT  
Upper Willamette Winter Steelhead  
CHART Watershed Ratings



Legend  
Watersheds (HUC5) by  
CHART rates

- High
- Medium
- Low



**Maps M1 through M7.** Upper Willamette River Steelhead ESU – Habitat Areas Under Consideration for Critical Habitat Designation (note: the Lower Willamette/Columbia River corridor is not shown but is under consideration as described in the text)

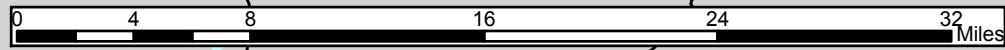
DRAFT  
Upper Willamette Winter Steelhead Distribution  
Upper Willamette Sub-basin (17090003)



Map M1

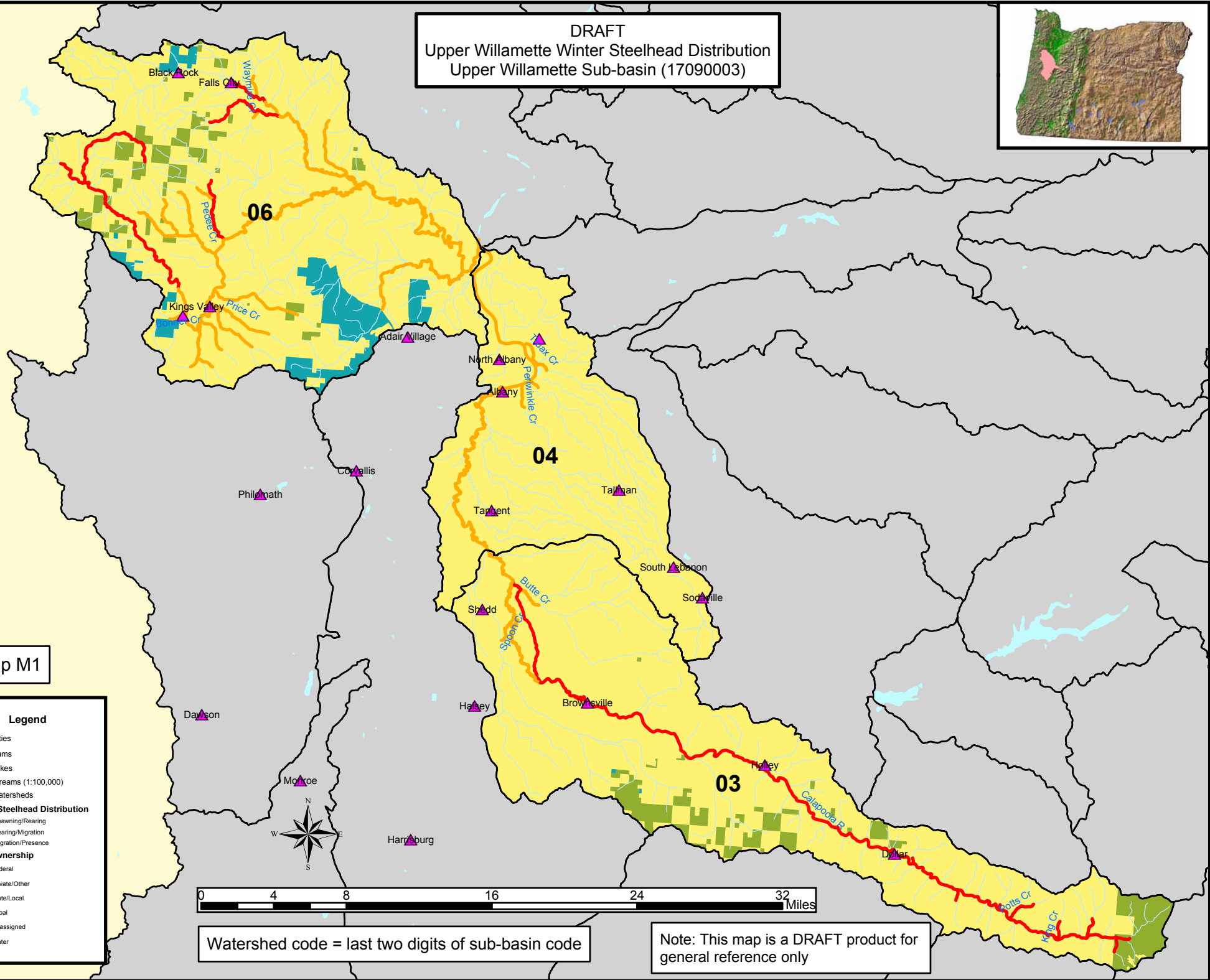
**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds
- Winter Steelhead Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water



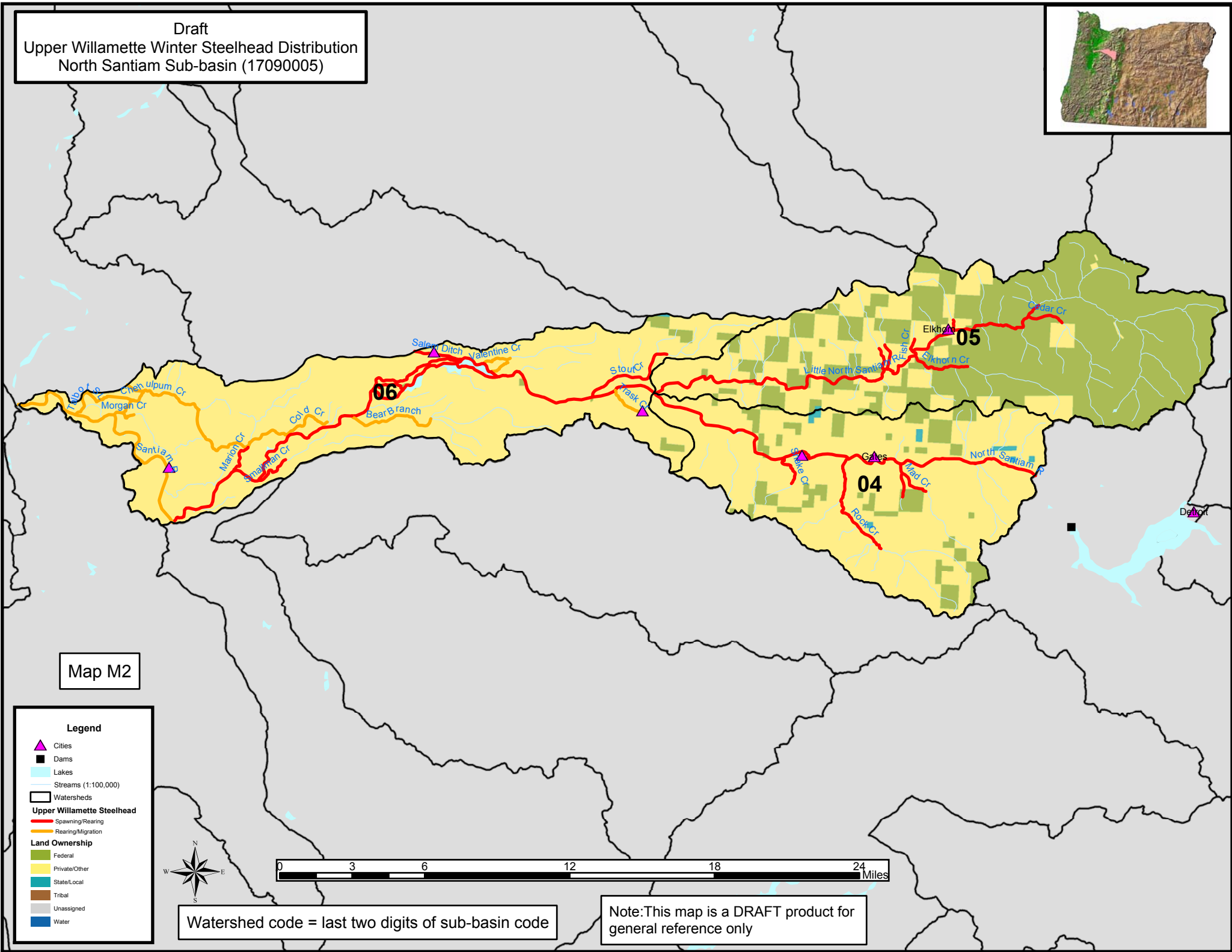
Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only





Draft  
Upper Willamette Winter Steelhead Distribution  
North Santiam Sub-basin (17090005)



Map M2

Legend

- ▲ Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds
- Upper Willamette Steelhead**
  - Spawning/Rearing
  - Rearing/Migration
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water

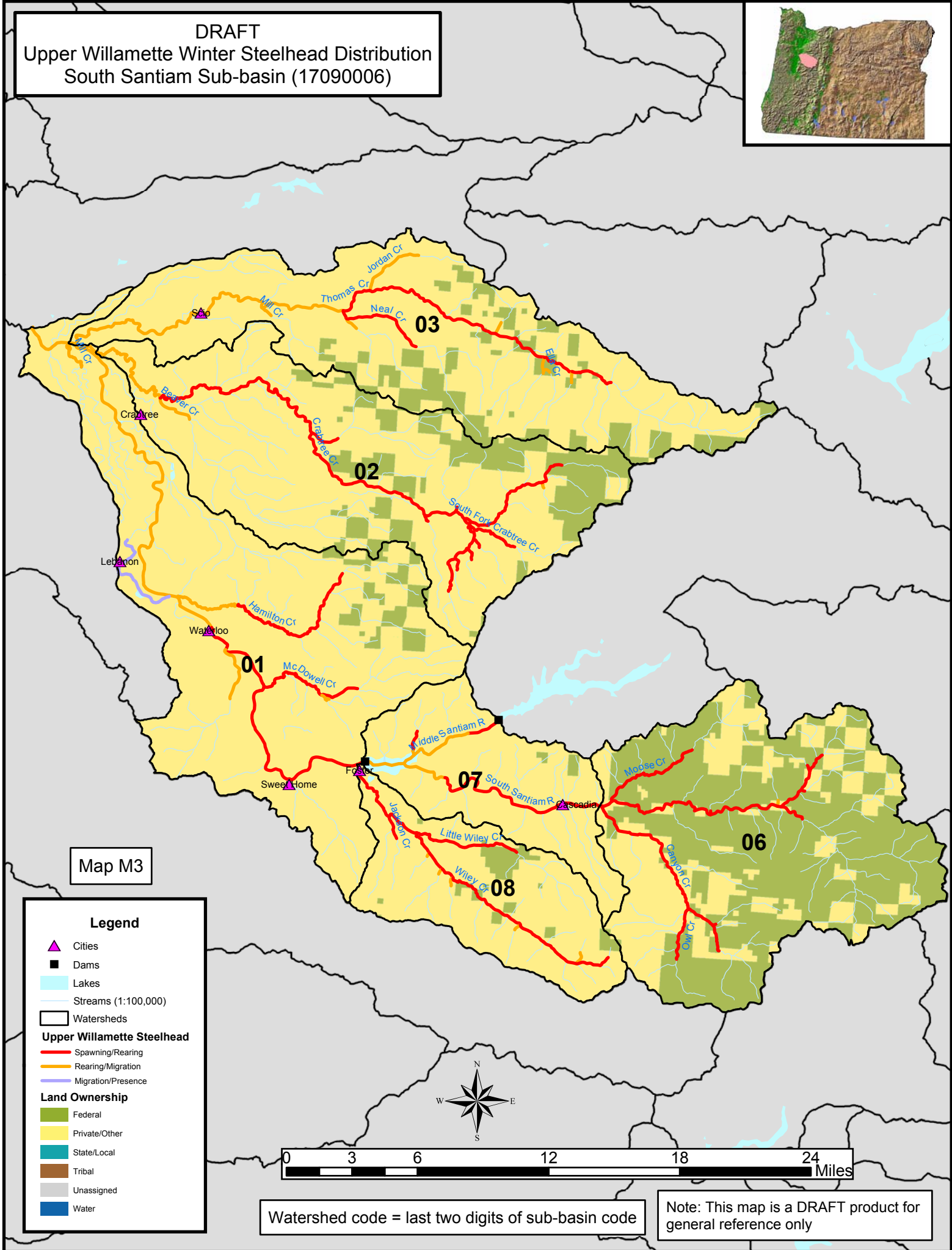


0 3 6 12 18 24 Miles

Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only

**DRAFT**  
**Upper Willamette Winter Steelhead Distribution**  
**South Santiam Sub-basin (17090006)**



Map M3

**Legend**

- ▲ Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds

**Upper Willamette Steelhead**

- Spawning/Rearing
- Rearing/Migration
- Migration/Presence

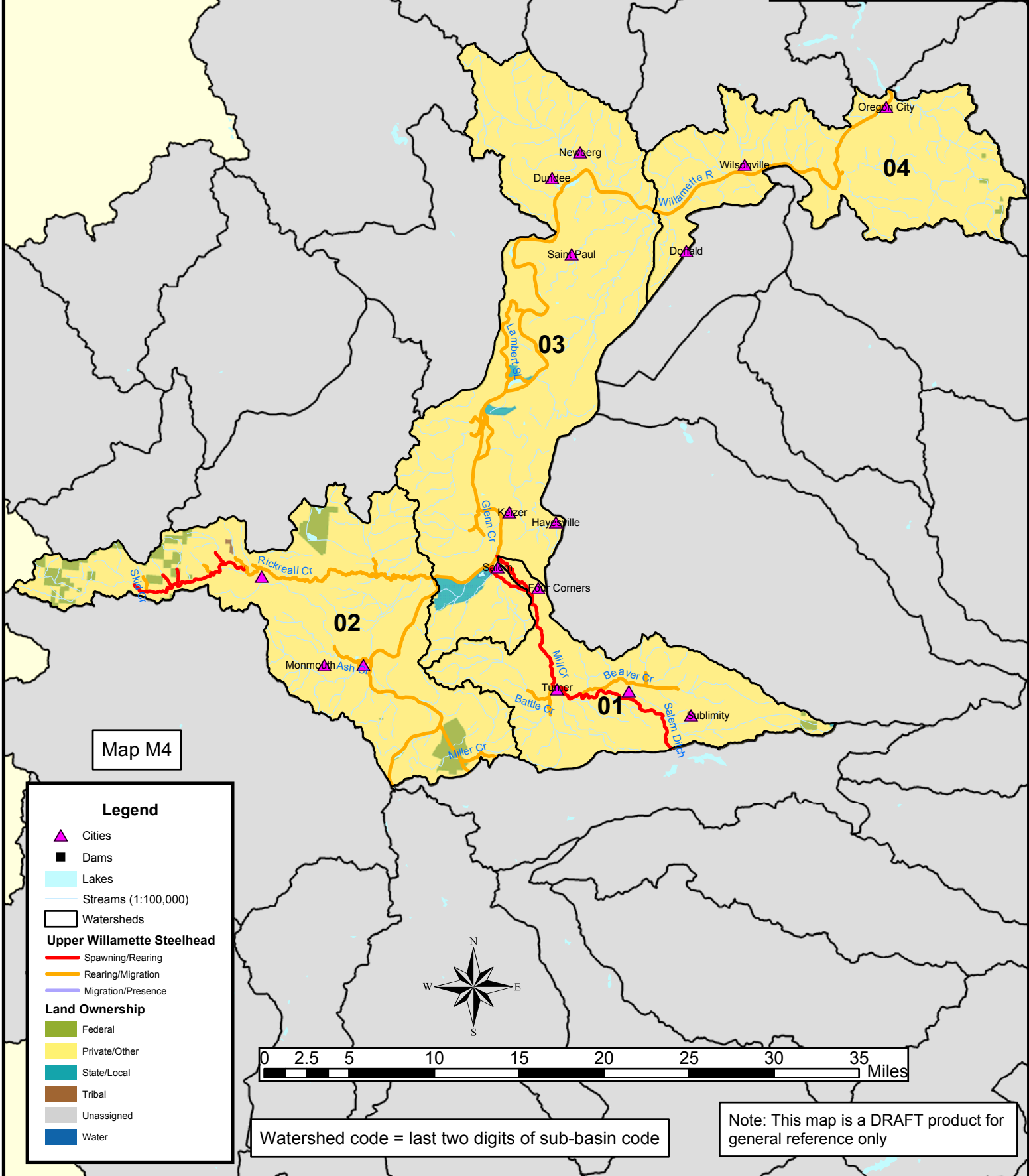
**Land Ownership**

- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water

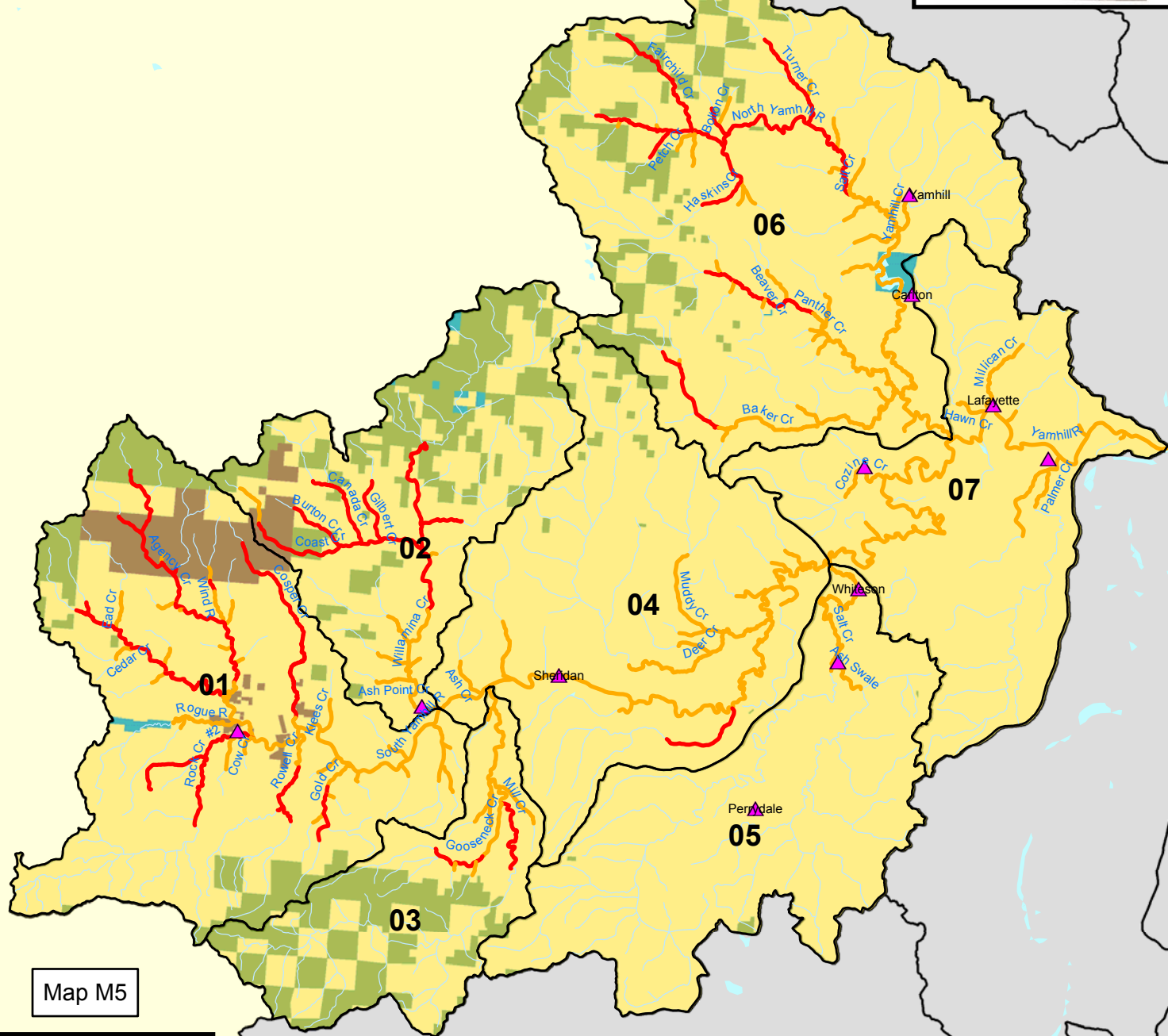
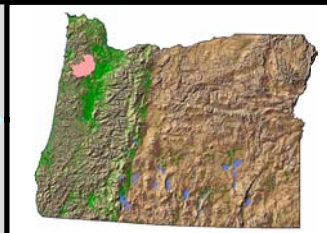
Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only

DRAFT  
Upper Willamette Winter Steelhead Distribution  
Middle Willamette Distribution (17090007)



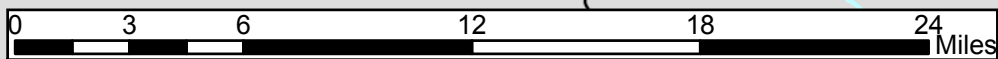
Draft  
Upper Willamette Winter Steelhead Distribution  
Yamhill Sub-basin (17090008)



Map M5

**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds
- Winter Steelhead Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water

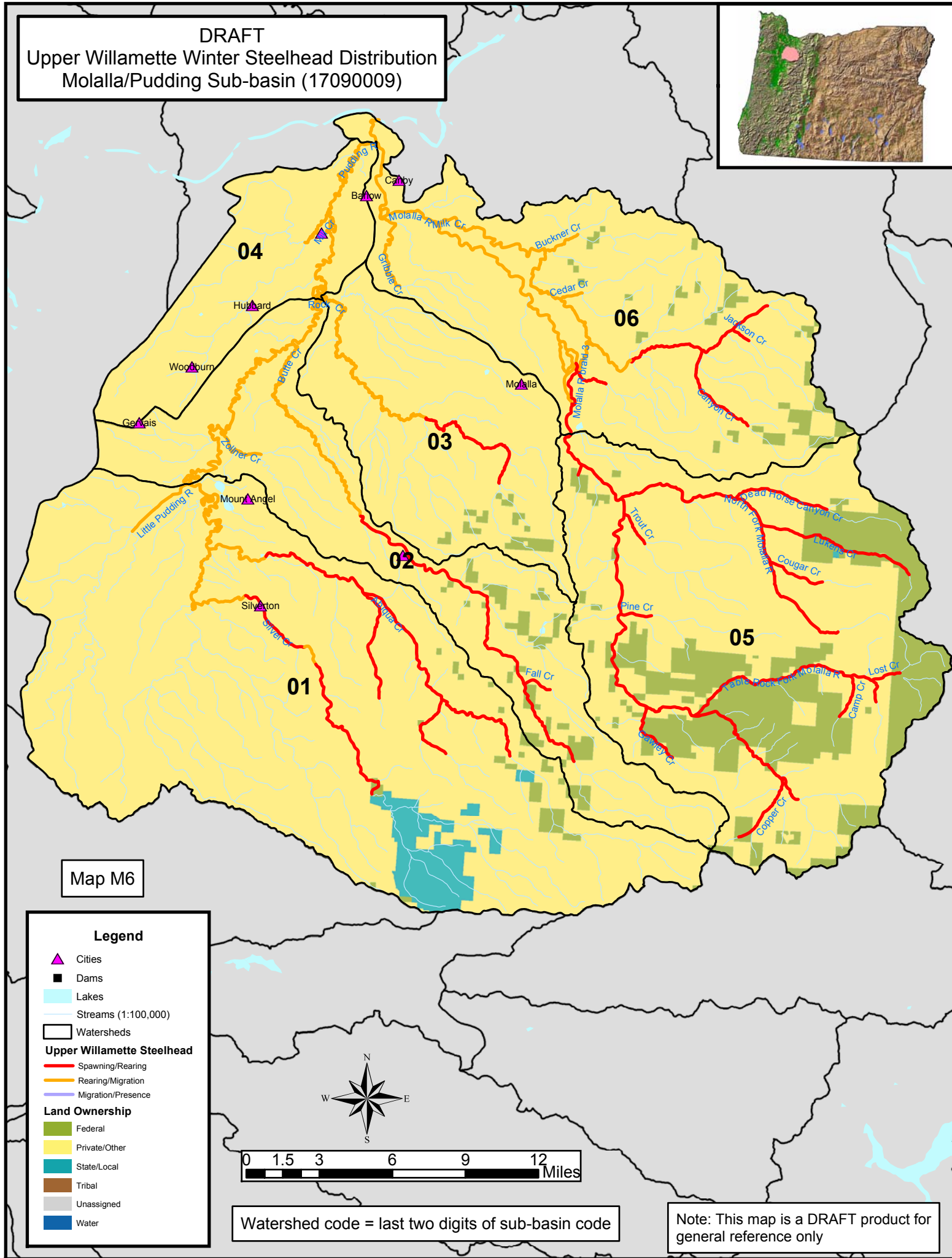
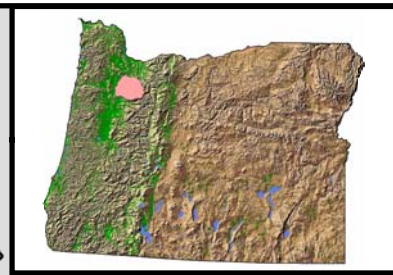


Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only



**DRAFT**  
**Upper Willamette Winter Steelhead Distribution**  
**Molalla/Pudding Sub-basin (17090009)**



**Map M6**

**Legend**

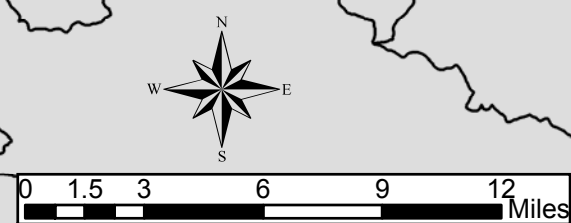
- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds

**Upper Willamette Steelhead**

- Spawning/Rearing
- Rearing/Migration
- Migration/Presence

**Land Ownership**

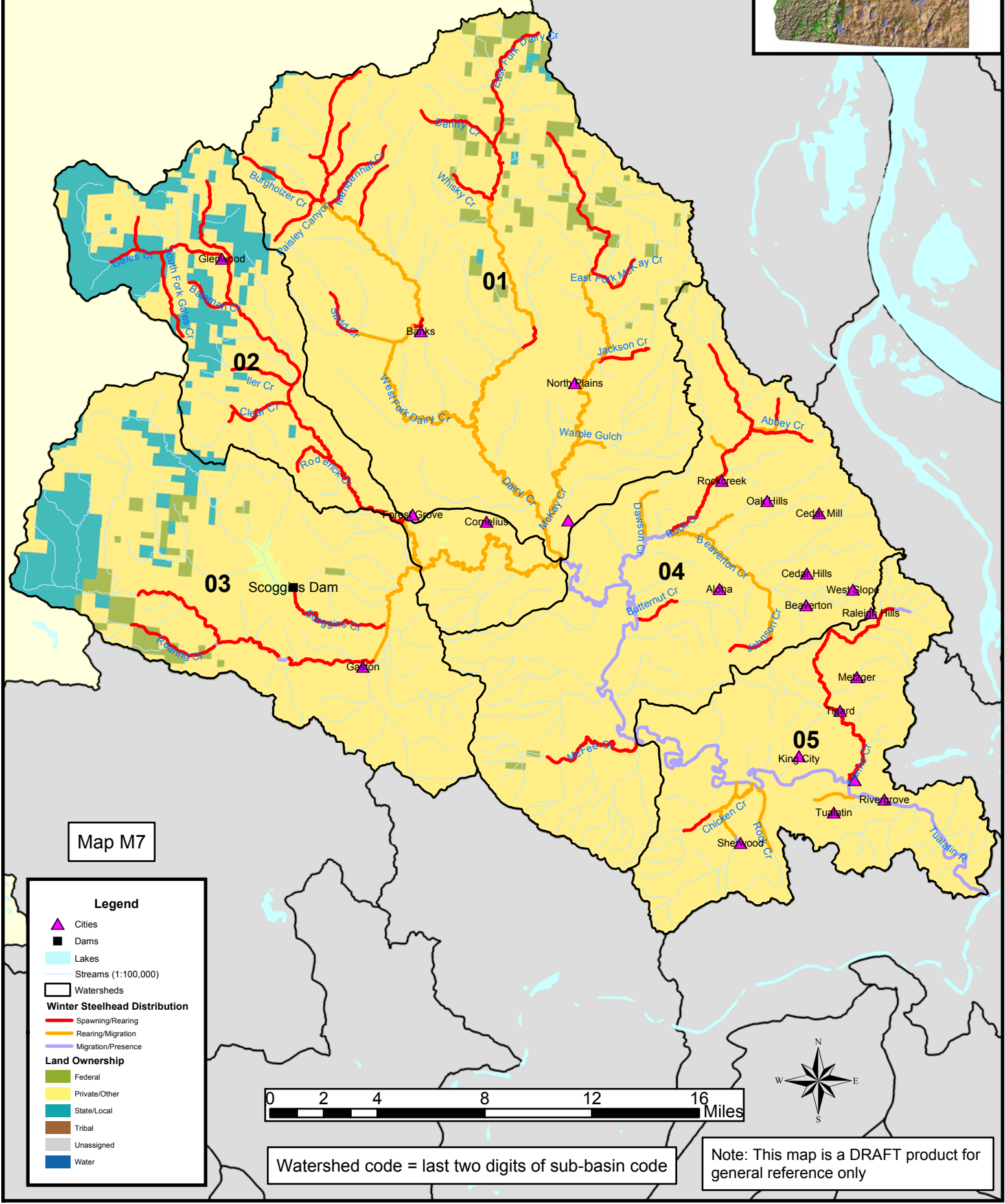
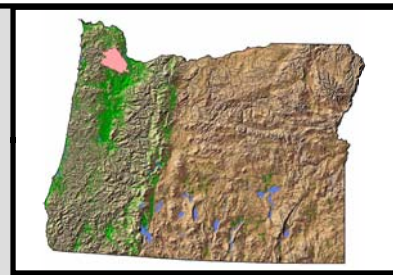
- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water



Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only

**DRAFT**  
**Upper Willamette Winter Steelhead Distribution**  
**Tualatin Sub-basin (17090010)**



Map M7

**Legend**

- ▲ Cities
- Dams
- Lakes
- Streams (1:100,000)
- Watersheds
- Winter Steelhead Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water

Watershed code = last two digits of sub-basin code

Note: This map is a DRAFT product for general reference only